
**OFFICE OF
THE INSPECTOR GENERAL**

**U.S. NUCLEAR
REGULATORY COMMISSION**

Review of NRC's Dry Cask
Storage Program

OIG-01-A-11 June 20, 2001

AUDIT REPORT



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June 20, 2001

MEMORANDUM TO: William D. Travers
Executive Director for Operations

FROM: Stephen D. Dingbaum/**RAI**
Assistant Inspector General for Audits

SUBJECT: REVIEW OF NRC'S DRY CASK STORAGE PROGRAM
(OIG-01-A-11)

Attached is the Office of the Inspector General's audit report titled, *Review of NRC's Dry Cask Storage Program*.

This audit was conducted due to the increased importance of dry cask storage. More than 1000 dry casks are expected to be in use by the end of the decade, and additional designs may need to be certified. Use of the direct final rule process for those certifications could result in significant savings of time and dollars.

At exit conferences on May 10 and June 6, 2001, agency staff agreed with our recommendations, and provided editorial suggestions that have been incorporated into the report where appropriate.

If you have any questions, please contact Bill McDowell at 415-5974 or me at 415-5915.

Attachment: As stated

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EXECUTIVE SUMMARY

BACKGROUND

In the early 1980's, the Nuclear Regulatory Commission (NRC) predicted that 39 nuclear plants could run out of needed space in their spent fuel pools by 1990. In 1982, Congress passed the Nuclear Waste Policy Act in an attempt to, among other things, address the need for nuclear power plants to store spent fuel without adversely affecting plant operations. The Act directed the Commission to (1) expedite effective use of available storage at reactor sites; (2) approve the use of one or more technologies without the need for approval specific to each site; and (3) establish procedures for licensing that technology.

The technology adopted for interim storage of spent fuel was dry cask storage. According to nuclear power industry estimates, there are about 230 casks loaded on spent fuel storage installations at reactor sites. The industry projects more than 1000 casks will be loaded by the year 2010.

PURPOSE

This audit was conducted due to the increased importance of dry cask storage. The objectives of the audit were to determine whether (1) the intent of the Nuclear Waste Policy Act that the NRC encourage and expedite the process by which licensees provide additional storage for spent nuclear fuel was met, and (2) opportunities exist to improve the dry cask certification process.

RESULTS IN BRIEF

One objective of the Nuclear Waste Policy Act was to avoid nuclear power plant shutdowns due to the loss of spent fuel storage capacity. Because of reracking and limited use of dry cask storage, no licensee to date has shut down a plant due to loss of spent fuel storage space. However, only limited additional storage capacity is available through continued reracking. Thus, more than 1000 dry casks are expected to be in use by the end of the decade. Additional cask designs may need to be certified. Use of the direct final rule process for those certifications could result in significant savings of time and dollars.

RECOMMENDATIONS

To improve the dry cask storage certification process, OIG recommends that the Executive Director for Operations: (1) revise the *NRC Regulations Handbook* to recommend the use of the direct final rule for new cask certifications, (2) revise the *NRC Regulations Handbook* to clarify the definition of "noncontroversial" as it pertains to the use of the direct final rule, and (3) publish the criteria for significant adverse comments in each direct final rule package.

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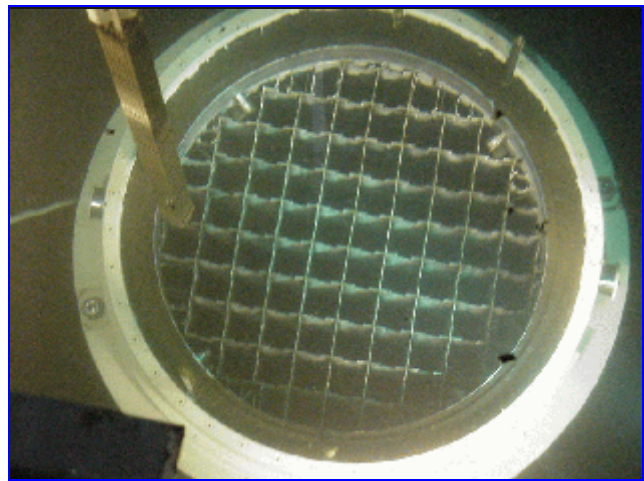
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I. BACKGROUND

NRC currently regulates 103 commercial nuclear power reactors that produce about 20 percent of this nation's electricity. These reactors are powered by enriched uranium-235 fuel in the form of small cylindrical pellets loaded into long rods. These rods are combined into fuel assemblies that typically contain about 200 fuel rods, are nearly 14 feet in length, and weigh approximately 900 pounds.

When this fuel can no longer sustain power production, it is removed from the reactor and placed in a spent fuel pool⁽¹⁾ to cool for at least 1 year. Utilities anticipated the availability of either a fuel reprocessing⁽²⁾ facility or long-term spent fuel disposal in a repository.

Therefore, most plants' spent fuel pools were not designed to store all of the fuel used by the plant during its operating life. Reprocessing was removed as an option during President Carter's administration (1977-1981)⁽³⁾ and a permanent repository to accept spent fuel is not available. Consequently, spent fuel continues to accumulate at reactor sites. If a licensee is unable to offload fuel from the reactor into the spent fuel pool, the plant may have to shut down.



**A fuel assembly is loaded into a cask
in a spent fuel pool.**

Source: Holtec, Intl.

In 1982, Congress passed the Nuclear Waste Policy Act in an attempt to, among other things, address the need for nuclear power plants to store spent fuel without adversely affecting plant operations. The Act directed the Commission to take actions to encourage and expedite the effective use of available storage at reactor sites. Section 218(a) of the Act required that the Department of Energy establish a demonstration program with the private sector for the dry storage of spent

¹ A spent fuel pool is an underwater storage and cooling facility for fuel elements that have been removed from a reactor.

² Fuel reprocessing is the processing of reactor fuel to separate the unused fissionable material from waste material.

³ President Reagan reversed the Carter policy but there was little interest by the industry in reprocessing. Later, President Clinton reinstituted the ban on reprocessing.

nuclear fuel at nuclear power plants. The intent was to establish one or more technologies that NRC may, by rule, approve without the need for additional site specific approvals. The Act also required that NRC, by rule, establish procedures for licensing that technology. Technologies considered as alternatives for expanding onsite storage capacity included casks, dry wells, and air-cooled vaults.

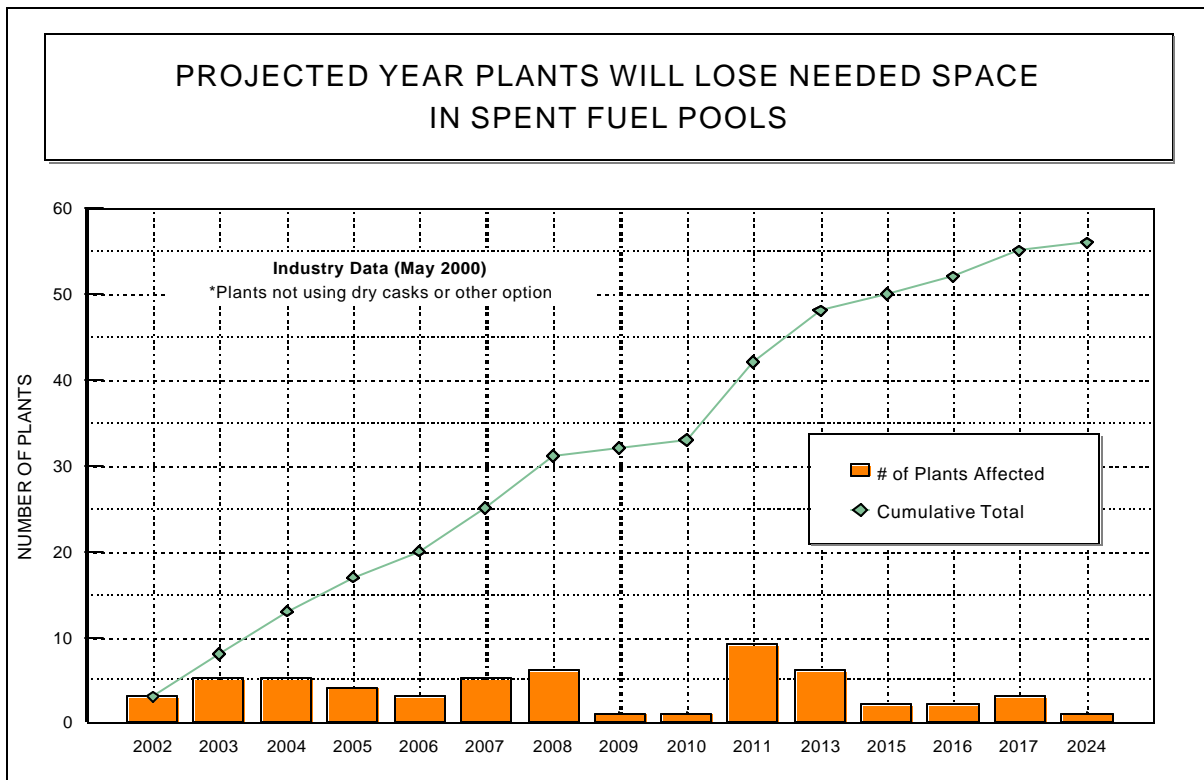
The technology adopted for interim storage of spent fuel was dry cask storage. Storage casks are steel or concrete, and vary in size and capacity. For example, one type of steel cask is about 17 feet high and 8 feet in diameter, weighs around 115 tons when loaded, and holds 32 fuel assemblies. According to industry estimates, there are about 230 casks loaded at 16 reactor sites. The industry also projects that 1000 casks will be loaded by the year 2010.



Dual purpose dry cask

Source: Holtec, Intl.

In 1982, NRC predicted that 39 plants could run out of space in their spent fuel pools by 1990. That did not happen because, among other things, licensees reracked⁽⁴⁾ their spent fuel so more space would be available in their spent fuel pools. However, reracking will not solve all licensees' longer-term storage needs. Based on industry data, the chart below shows a current projection of the number of plants that could lose needed space in their pools over the next 23 years without some method of interim storage.



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Reracking is utilized by licensees to increase capacity in the spent fuel pools by setting fuel assemblies closer together and installing new storage racks. Many licensees choose reracking over dry cask storage because it is simpler and has little impact on plant operations.

Licensees must obtain NRC approval to use dry cask storage in one of two ways:

Site-specific license. To obtain a site-specific license, a licensee operating a nuclear power plant requests authorization to develop and use an independent spent fuel storage installation which includes a dry cask or other storage system. Public involvement is provided through hearings that may be granted to those affected by the activity. Dry cask storage systems under a site-specific license are generally unique to that site.

General license. To address Nuclear Waste Policy Act requirements, NRC granted operating reactor licensees a general license to use dry cask storage systems certified by NRC, provided the requirements of the certificate of compliance⁽⁵⁾ were met. These certificates of compliance, and any changes (amendments⁽⁶⁾), go through the rulemaking process⁽⁷⁾ which does not provide an opportunity for a hearing. The final rule, published in the Federal Register, provides official notification that a new or amended certificate of compliance has been added to the list of approved cask designs. Appendix B depicts NRC's cask approval process for both site-specific and general licensees.

⁵ NRC issues a certificate of compliance that indicates the acceptability of a dry cask storage system. The certification contains the conditions and limitations for using the storage system.

⁶ Amendments are required for any alteration of the certificate of compliance, from an administrative change in ownership of the certificate to a technical modification of the dry cask storage system. Applications for amendments are changes submitted by the certificate holder to modify the certificate of compliance.

⁷ Once a preliminary safety evaluation report is completed, a proposed rule is printed in the Federal Register. A period of time is provided to solicit comments from the public and interested parties. Resolution of comments and final rulemaking to add a cask to the list of approved casks are published in the Federal Register.

II. PURPOSE

Because of the increased importance of dry cask storage, the Office of the Inspector General (OIG) reviewed NRC's dry cask storage program. The objectives of this audit were to determine whether (1) the intent of the Nuclear Waste Policy Act, that the NRC encourage and expedite the process by which licensees provide additional storage for spent nuclear fuel, was met; and (2) opportunities exist to improve the dry cask certification process. Appendix A contains information on the scope and methodology of this audit.

III. FINDINGS

One objective of the Nuclear Waste Policy Act was to avoid nuclear plant shutdowns due to the loss of spent fuel storage space. As a result of NRC and industry actions, no plants have shut down for that reason. However, in the future, NRC may be able to make the cask certification process more efficient. Based on OIG analysis of new cask certifications completed in 2000, use of the abbreviated direct final rule process⁽⁸⁾ for future new cask certifications could result in significant savings in time and dollars.

A CONGRESSIONAL INTENT WAS MET

Congress envisioned that the dry storage required at nuclear power plants would be brought to pass through:

- An expedited process for approving the use of the technology, and
- A generic dry cask technology with parameters broad enough to be used by multiple licensees.

NRC's actions to implement and comply with the language in Sections 133 and 218(a) of the Act established a general license provision in the regulations to allow licensees to store spent fuel in dry casks without application or request for approval from NRC. As part of this new provision, the agency established a rulemaking process for NRC approval of a dry cask storage design. Rulemaking allows for written public comments on proposed rules rather than a hearing as with a site-specific licensing action. The general license provision and the rulemaking process for using cask designs was intended to streamline the approval process. However, benefits of this action have not yet been realized. There have been no hearings under any completed site-specific licensing actions. As a result, the rulemaking process for dry cask certifications under a general license takes about 1 year longer than the process for a site-specific license.⁽⁹⁾

The use of a generic technology and the rulemaking process could have made it unnecessary for each site to obtain specific approval of a storage device as with the existing site-specific regulations. According to NRC and Department of Energy officials, the trend toward unique cask designs is the natural result of private industry driving the manufacture of casks. Vendors wish to offer customers their own cask, with proprietary features, rather than a generic cask that any other vendor could manufacture. As a result, NRC has certified 14 different casks since 1990. In

⁸ The direct final rule is a regulatory process that is used for noncontroversial regulatory amendments. See section titled *Guidance Needs To Be Revised*, page 7 of this report, for further clarification.

⁹ Hearings would add an undetermined amount of time to the process.

addition, agency officials said amendments to approved casks are often needed to enable their use by utilities other than the original purchaser.

Rulemaking takes longer than the site-specific process (without hearings) and a generic dry storage technology was not developed. However, reracking and limited use of dry cask storage kept plants from shutting down. Because no plants have shut down due to the loss of storage space, the intent of Congress has been met to this point in time. However, only limited increases in spent fuel storage can be obtained through continued reracking and dry cask storage will become more important.

B. OPPORTUNITIES EXIST TO GAIN EFFICIENCIES IN CASK CERTIFICATION

NRC strives to impose only the level of burden on its stakeholders necessary to maintain safety. The agency has made improvements to its rulemaking process and uses an abbreviated format, the direct final rule process, to amend dry cask storage certificates of compliance. However, NRC has not defined the criteria for determining when to use this process⁽¹⁰⁾ for new cask certifications. The agency may be able to realize greater efficiencies if it uses the direct final rule process for new cask certifications.

Reduction of Regulatory Burden

One of NRC's performance goals is to reduce unnecessary regulatory burden on stakeholders through continuous improvement to the regulatory framework, and through improvements in processes to reduce unnecessary costs to stakeholders. NRC has taken a number of actions to improve the rulemaking process for dry cask storage under a general license:

- Due to its routine nature, the staff no longer has to prepare a separate rulemaking plan for each cask.
- The Commission has delegated to the Executive Director for Operations authority to review and approve rulemaking for dry cask storage activities.
- The Spent Fuel Project Office's implementation of the direct final rule process for amendments reduced rulemaking time from 51 weeks to about 23 weeks.

Guidance Needs To Be Revised

The direct final rule is a regulatory process that is used for noncontroversial regulatory amendments. The *NRC Regulations Handbook* states that the rule

¹⁰ During the course of this audit, NRC revised the *NRC Regulations Handbook* (NUREG-BR/0053, Rev 5) to provide additional guidance on the use of the direct final rule. The guidance suggests using the direct final rule process only for amendments to certificates of compliance rather than for original certifications.

becomes effective usually 75 days after publication. If NRC receives significant adverse comment⁽¹¹⁾ within the allowed public comment period, the agency withdraws the rule and uses the full rulemaking process.⁽¹²⁾

A senior manager in the Spent Fuel Project Office said he would consider using the direct final rule process for new cask certifications if NRC more clearly defines the terminology. However, the *NRC Regulations Handbook* suggests use of the direct final rule process only for amendments to certificates.

Significant Adverse Comments Should Be Explained

In 1998, the Commission approved the staff's recommendation to use the direct final rule process for certificates of compliance because NRC staff believed that additions and revisions to the list of approved spent fuel storage casks were noncontroversial and routine. The Commission agreed that if no significant adverse comments were received on two successive new cask certifications, the agency could begin using the direct final rule.⁽¹³⁾

While one agency official stated that significant adverse comments have been received on recent new cask certifications, the agency does not specifically identify those comments to the public. And, because of these comments, the agency has not yet met the threshold agreed to by the Commission for beginning to use the direct final rule. The most recent cask certification received only two letters containing 14 comments; both letters were from the cask vendor. NRC disagreed with four of the comments that asserted that the agency was being overly restrictive regarding certain technical specifications. In response to four other comments, NRC agreed to clarify language in the certificate of compliance and make an editorial change to the vendor's safety analysis report. The remaining six comments identified needed editorial corrections to NRC's safety evaluation report.

The *NRC Regulations Handbook* provides criteria for determining whether a comment is significant and adverse. It would be beneficial for all stakeholders to know what the NRC criteria are for determining if a comment is significant and adverse. If the criteria were included in the rulemaking package, stakeholders would have a better understanding of how the NRC review process works and the basis for designating comments as significant and adverse.

¹¹ The Administrative Conference of the United States defines a significant adverse comment as "one where the commenter explains why the rule would be inappropriate, including challenges to the rule's underlying premise or approach, or would be ineffective or unacceptable without a change."

¹² A full rulemaking is started concurrent with a direct final rule. No time is lost if the direct final rule cannot be used because a significant adverse comment(s) is received.

¹³ SECY-98-188, *A Proposed Simplification of the Rulemaking Process for Certificate of Compliance Rulemakings*, August 3, 1998. Staff Requirements memorandum - SECY-98-188, September 3, 1998.

NRC Can Further Reduce Regulatory Burden

Draft Schedules for Rulemakings, used by the Spent Fuel Project Office, indicates that it takes 51 weeks to add a new design to the approved list of certified casks using the full rulemaking process. It takes 23 weeks to amend a certificate of compliance using the direct final rule process. Therefore, the difference in time between using full rulemaking and the direct final rule process is 28 weeks.

OIG reviewed four new cask certifications and four amendments issued in 2000. The direct cost of rulemaking for each of the four new cask designs was about \$75,000 more than the cost of using the direct final rule process for amendments. Additional casks may have to be certified and potential savings in time and dollars could be significant if NRC uses the direct final rule for new cask certifications.

IV. SUMMARY

Because of reracking and limited use of dry cask storage, no licensee to date has shut down a plant due to loss of spent fuel storage space. However, only limited additional storage capacity is available through continued reracking. More than 1000 dry casks are expected to be in use by the end of the decade. Additional cask designs may need to be certified. Use of the direct final rule process for those certifications could result in significant savings of time and dollars. In addition, identification and explanation of the criteria for significant adverse comments would aid industry in improving submittals related to certification actions and the public in providing more focused comments.

V. RECOMMENDATIONS

To improve the dry cask storage certification process, OIG recommends that the Executive Director for Operations:

1. Revise the *NRC Regulations Handbook* to recommend the use of the direct final rule for new cask certifications.
2. Revise the *NRC Regulations Handbook* to clarify the definition of "noncontroversial" as it pertains to the use of the direct final rule.
3. Publish the criteria for significant adverse comments in each direct final rule package.

VI. MANAGEMENT RESPONSE

On May 10 and June 6, 2001, OIG met with program office officials and staff from the Office of the Executive Director for Operations. They agreed with our recommendations, and provided informal editorial suggestions that have been incorporated into this report where appropriate.

SCOPE AND METHODOLOGY

The scope of this audit was limited to those areas of NRC operations related to the regulation of dry cask storage. To determine the adequacy of NRC's efforts with dry cask storage, OIG attended an NRC public meeting, and conducted (1) a review of regulatory and program criteria governing the regulation of dry cask storage; (2) discussions with NRC personnel from the Offices of Nuclear Material Safety and Safeguards, the General Counsel, Nuclear Reactor Regulation, and Nuclear Regulatory Research; (3) on-site visits to a dry cask manufacturer and a facility using dry cask storage systems; (4) interviews with industry representatives, a public information group, a former NRC Commissioner, and Department of Energy representatives; (5) a review of Spent Fuel Project Office files; and (6) analysis of data from NRC's Resource Information Tracking System.

This audit was conducted from August 2000 to March 2001 in accordance with generally accepted Government auditing standards and included a review of management controls related to the objectives of the audit. The major contributors to this report were William McDowell, Robert Moody, David Horn, and Yvette Russell.

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SIMPLIFIED VIEW OF NRC'S CASK APPROVAL PROCESS

